

this average were: 4th, 102; 6th, 37; 11th, 52; 13th, 72; 14th, 41.

Auroras were reported by a large percentage of observers in: North Dakota, 165; Minnesota, 61; Wisconsin, 57; Michigan, 54.

Auroras were reported most frequently in: North Dakota, 16 days; Iowa, Michigan, and Minnesota, 10.

CANADIAN REPORTS.

Thunderstorms and auroras. No thunderstorms were reported.

Auroras were reported as follows: St. Johns, 13th; Halifax, 13th; Yarmouth, 31st; St. Andrews, 13th, 14th; Charlottetown, 13th, 14th; Father Point, 6th, 14th, 15th; Quebec, 13th, 14th, 28th, 31st; Montreal, 14th, 22d; Rockcliffe, 4th, 13th, 14th, 31st; Toronto, 4th, 13th, 14th; White River, 4th, 12th, 13th, 14th, 19th, 20th, 21st; Port Stanley, Saugeen, and Parry Sound, 4th; Port Arthur, 12th, 13th, 14th, 17th, 26th, 27th; Winnipeg, 3d, 6th, 7th, 10th to 14th, 20th, 25th, 31st; Minnedosa, 3d, 6th to 12, 15th, 26th, 30th; Qu'Appelle, 2d, 3d, 11th; Medicine Hat, 5th, 12th; Swift Current, 11th; Prince Albert, 3d, 4th, 11th; Battleford, 4th, 7th, 14th, 18th, 28th.

INLAND NAVIGATION.

The *extreme and average stages of water* in the rivers during the current month are given in Table VIII, from which it appears that the only river that rose above the danger line was the Ohio, at Evansville, Ind., which on the 25th attained the gauge reading of 32.1. In a number of cases, however, the rivers rose to a point but very little below danger line, for example, the Mississippi, at New Orleans, attained 12.6 on the 1st; the Monongahela, at Pittsburgh, 20.8 on the 31st; the Big Sandy, at Louisa, Ky., 33.4 on the 31st, and the Tennessee, at Johnsonville, 20.9 on the 23d. The Mississippi, at St. Paul, La Crosse, and Dubuque, became sufficiently free from ice to allow observations to be taken on the 10th, 22d, and 23d, respectively. Heavy floods and great damage occurred on most of the rivers of New England on the 1st, 2d, and 3d of the month. As the Weather Bureau has no river stations in this region we can only summarize the newspaper accounts which state that the Connecticut, at Hartford, was 25 feet above low water, and at Bellows Falls, Vt., 17 feet. At Hudson, N. Y., the freshet in the Hudson River reached proportions never before known, but the ice in the river remained firm; at Albany the Hudson rose to 16 feet 10 inches above the normal level of the stream, or two inches below the high-water mark of 1893. The Mohawk River, at Rome and Schenectady, was the highest known in many years. The Passaic River, at Paterson, N. J., attained a point 3 feet lower than the great freshet of February. The Merrimac, at Lowell, reached 12 feet 9 inches on the dam, or nearly a foot beyond the freshet of 1895; at Lawrence and Haverhill, Mass., the Merrimac reached the highest point ever known.

The heavy rains in eastern Tennessee and southwestern Virginia, on the 29th, caused a number of landslides and the loss of bridges throughout that region. Five persons were drowned by the floods in Russell County, Va., two others near Abrams Falls, and two lives were lost in Clay County, Ky., by the sudden flooding of Sextons Creek. The water is reported to have risen so rapidly that it seemed as if it were a solid wall 15 or 20 feet high. Several other dwelling houses and a number of outbuildings in the valley of the creek were washed away.

ICE IN RIVERS AND HARBORS.

The state of ice in rivers and harbors is shown in detail on the Charts of Snow on the Ground, published weekly by the Weather Bureau, from which it appears that there was a general diminution in the thickness of ice, and on March 30 the condition was about as follows: (Thickness in inches.)

Rivers and harbors were generally free from ice, except Buffalo, 6; Sault Ste. Marie, 22; and Duluth, 25. Fields of ice impeded navigation in all the lakes, but the prospects were good for an early opening. The Missouri and Mississippi rivers were free from ice.

ANCHOR ICE IN AQUEDUCTS.

Serious difficulty was caused by the formation of ice, and especially "anchor" ice, in the early portion of the month at Macopin Dam, on the Pequannock River, which supplies the city of Newark, N. J., with water. As the formation of "anchor" ice is still but little understood, and is liable to cause a great deal of trouble in reservoirs and water pipes, these occurrences deserve special study. It is stated that the gate screens and intake screens at the Macopin Dam and at the Clifton Avenue reservoir were suddenly and entirely choked up by the accumulation of anchor ice attached to the solid surfaces underneath the water surface. It is said that such trouble had never occurred before in this aqueduct, and it is hoped it will not occur again.

METEOROLOGY AND MAGNETISM.

By Prof. FRANK H. BIGELOW.

For a description of the methods of constructing the tables and curves of Chart V, see the WEATHER REVIEW for October, 1895, and January, 1896. The numbers in the columns H. and D. are added respectively to the mean values for Washington and Toronto, i. e., $H=0.18250$; $D=175.0$. The values of the vertical forces are omitted, as well as d_z , s , a , which depend upon it. The month of March was characterized by very stagnant eastward circulation, and local rather than general weather conditions. The magnet watch also showed signs of inversion from the direct type, which had prevailed for several periods, to the inverse type, and was attended by considerable unsteadiness in the 24-hourly rates.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective services.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 53.0°, or 1.1° below normal; the highest was 92°, at Jasper on the 29th, and the lowest, 20°, at Newburg on the 12th and 13th. The average precipitation was 5.10, or 0.66 less than normal; the greatest monthly amount was 10.05, at Daphne, and the least, 2.48, at Opelika.

Arizona.—The mean temperature was 57.6°, or 4.0° above normal;

the highest was 103°, at Fort Mojave on the 25th, and the lowest, 2°, at Whipple Barracks on the 6th. The average precipitation was 0.44, or 0.65 less than normal; the greatest monthly amount was 1.44, at Oracle, and the least, 0.05, at Wilcox.

Arkansas.—The mean temperature was 48.7°, or 2.0° below normal; the highest was 85°, at Warren on the 29th, and at Camden and Washington on the 31st, and the lowest, 12°, at Keeses Ferry on the 13th. The average precipitation was 5.28, or 0.47 above normal; the greatest monthly amount was 7.88, at Russellville, and the least, 2.06, at Silver Springs.

California.—The mean temperature was 53.5°, or 0.5° above normal; the highest was 111°, at Ogilby on the 25th, and the lowest, 14° below

zero, at Bodie on the 5th. The average precipitation was 3.38, or 0.05 below normal; the greatest monthly amount was 24.85, at Fordyce Dam, while none occurred at Indio and Volcano Springs.

Colorado.—The month was warmer than the average in the mountain districts and the valleys of the Grand, Gunnison, and lower Arkansas; elsewhere the temperature was generally below normal; the highest was 84°, at Rocky Ford, Las Animas, and Minneapolis on the 25th, and the lowest, 20° below zero, at Alma on the 3d. It was unusually wet over the north-central section, the Divide, and throughout the mountain districts, being especially stormy over Lake and Summit counties. Marked deficiencies in precipitation occurred over the extreme southeastern, western, and northwestern counties. The greatest precipitation, 9.70, occurred at Climax, and the least, "trace," at Sagauche.

Florida.—The mean temperature was 63.0°, or 3.0° below normal; the highest was 93°, at Earnestville on the 31st, and the lowest, 29°, at Fort Meade and St. Francis on the 21st. The average precipitation was about 0.50 below normal; there were sections where it was decidedly in excess, and others where the deficiency was equally marked. The greatest amount was 10.57, at Milton, and the least, 0.55, at Manatee.

Georgia.—The mean temperature was 53.0°, or about 2.0° below normal; the highest was 91°, at Allentown on the 30th, and the lowest, 18°, at Clayton on the 21st. The average precipitation was 3.51, or about 1.00 below normal; the greatest monthly amount was 5.61, at Blakely, and the least, 1.41, at Augusta.

Idaho.—The mean temperature was 33.0°, or 0.9° above the mean of March, 1895; the highest was 80°, at Payette on the 29th, and the lowest, 33° below zero, at Junction on the 1st. The average precipitation was 1.95; the greatest monthly amount was 4.66, at Cariboo, and the least, 0.20, at Kootenai.

Indiana.—The mean temperature was 35.4°, or 2.5° below normal; the highest was 77°, at Mt. Vernon on the 31st, and the lowest, 3° below zero, at South Bend on the 20th. The average precipitation was 3.10, or 0.05 in excess of normal; the greatest monthly amount was 5.88, at Princeton, and the least, 1.55, at Lafayette.

Illinois.—The temperature during the month was uniformly low. The mean was 35.6°, or 2° below normal; the highest temperature was 79°, at Mt. Vernon on the 31st, and the lowest, 4° below zero, at Champaign on the 13th. The average precipitation was 1.84, or 0.94 below normal; the greatest monthly amount was 5.49, at Mt. Carmel, and the least, 0.43, at Bushnell and Glenwood.

Iowa.—The mean temperature was 30.9°, or about 1.0° below normal; the highest was 81°, at Belknap on the 30th, and the lowest, 12° below zero, at Rock Rapids on the 13th. The average precipitation was 1.10, or 0.97 below normal; the greatest monthly amount was 3.99, at Sidney, and the least, 0.16, at Keosauqua.

Kansas.—The mean temperature was 39.2°, or 2.0° below normal; the highest was 95°, at Macksville on the 27th, and the lowest, 5° below zero, at Goodland on the 18th. The average precipitation was 0.79, or 0.70 below normal; the greatest monthly amount was 3.60, at Eldorado, and the least, "trace," at Garden City, Greensburg, and Macksville.

Kentucky.—The mean temperature was 41.1°, or 3.5° below normal; the highest was 80°, at Marrowbone and Middlesboro on the 29th, and at Pryorsburg on the 31st, and the lowest, 8°, at Sandy Hook on the 17th. The average precipitation was 6.16, or 1.86 above normal; the greatest monthly amount was 9.90, at Williamsburg, and the least, 3.32, at Princeton. The average snowfall for the State was 8 inches.

Louisiana.—The mean temperature was 58.3°, or 0.3° below normal; the highest was 90°, at Liberty Hill on the 31st, and the lowest, 22°, at Amite on the 20th. The average precipitation was 4.34, or 0.37 below normal; the greatest monthly amount was 9.00, at Melville, and the least, 0.70, at Napoleonville.

Maryland.—The mean temperature was 36.6°, or 4.0° below normal; the highest was 74°, at Wilmington, Del., on the 30th, and the lowest, 13° below zero, at Deer Park on the 14th. The average precipitation was 4.38, or 0.80 above normal; the greatest monthly amount was 6.80, at Sunnyside, and the least, 2.18, at Princess Anne. The average snowfall was 12.4 inches.

Michigan.—The mean temperature was 25.7°, or 3.0° below normal; the highest was 69°, at Birmingham on the 29th, and at Soldiers Home, Vandalia, and Mottville on the 31st, and the lowest, 19° below zero, at Boon and Iron River on the 13th. The average precipitation was 1.33, or 0.35 below normal; the greatest monthly amount was 2.45, at Olivet, and the least, 0.11, at Powers.

Minnesota.—The mean temperature was 21.4°; the highest was 64°, at New Ulm on the 30th, and the lowest, 37° below zero, at Koochi-ching on the 11th. The average precipitation was 1.97; the greatest monthly amount was 4.21, at Milan, and the least, 0.20, at Red Wing.

Mississippi.—The mean temperature was 54.2°, or 2.2° below normal; the highest was 88°, at Enterprise on the 30th, and at Vaiden on the 31st, and the lowest, 19°, at French Camp on the 13th. The average precipitation was 4.96, or 1.19 below normal; the greatest monthly amount was 9.09, at Woodville, and the least, 0.93, at Macon. An average depth of about 2 inches of snow fell over the northern portion of the State on the 12th.

Missouri.—The mean temperature was 39.0°, or 2.1° below normal; the highest was 82°, at Grovedale on the 18th, and at Humansville and Sarcoxie on the 31st, and the lowest, 2°, at Unionville on the 13th.

The average precipitation was 2.03, or 0.59 less than normal; the greatest monthly amount was 8.70, at New Madrid, and the least, 0.57, at Downing and Darksville. The average snowfall was 5.2 inches.

Montana.—The mean temperature was 27.0°, or 1.0° below normal; the highest was 76°, at Wibaux on the 24th, and the lowest, 38° below zero, at Mussellsell on the 3d. The average precipitation was 1.01, or 0.25 above normal; the greatest monthly amount was 3.90, at Red Lodge, and the least, 0.16, at Fort Benton.

Nebraska.—The mean temperature was 30.5°, or 3.8° below normal; the highest was 90° at Benkleman on the 24th, and the lowest, 24° below zero, at Alliance on the 3d. The average precipitation was 1.45, or 0.27 above normal; the greatest monthly amount was 3.83, at Sutton, and the least, 0.35, at Wilsonville.

Nevada.—The mean temperature was 39.4°, or 1.0° above normal; the highest was 90°, at St. Thomas on the 24th, and the lowest, 18° below zero, at Stofiel on the 3d. The average precipitation was 1.15, or 0.11 below normal; the greatest monthly amount was 3.99, at Lewers Ranch, and the least, 0.22, at Wadsworth.

New England.—The temperature during March was considerably below normal throughout New England. The greatest departure from the average was -4.4° at Keene, N. H., while at Fairfield, Me., it was only 1.5° below the usual March conditions. The highest temperatures, with scarcely an exception, occurred on the 26th and 31st; the maximum reported was 66° at Chestnut Hill on the 26th. The minimum at most stations was recorded on the 14th, when an area of high barometer was central just west of us; the chief minimum was -20° at Berlin Mills, N. H.

March, like its immediate predecessor, was very stormy, and consequently the precipitation was excessive in all parts of New England. The heavy rain which commenced on the last day of February, caused, with the melting snows, dangerous floods which were accompanied by great financial loss in many places. At Lawrence the Merrimac River attained the highest point on record since the Essex Company's dam has been in existence, and many other places report all previous river records broken.

New Jersey.—The mean temperature was 34.0°, or 2.8° below normal; the highest was 70°, at Beverly on the 28th, and the lowest, 8° below zero, at River Vale on the 13th. The average precipitation was 5.34, or 1.56 above normal; the greatest monthly amount was 7.38, at River Vale, and the least, 3.14, at Cape May City.

New Mexico.—The mean temperature was about normal; the highest was 90°, at Eddy on the 26th, and the lowest, 2° below zero, at Hot Sulphur Springs on the 7th, and at Labelle on the 8th. The precipitation averaged slightly below normal, and was very unevenly distributed; the greatest monthly amount was 2.20 at Chama, while no rain fell at Bernalillo, Eddy, Engle, Galisteo, Las Cruces, and Los Lunas.

North Carolina.—The mean temperature was 47.2°, or 0.9° below normal; the highest was 85°, at Sloan on the 30th, and at Lumberton on the 31st, and the lowest, 8°, at Jefferson and Linville on the 14th. The average precipitation was 2.59, or 1.95 below normal; the greatest monthly amount was 5.08, at Jefferson, and the least, 1.50, at Monroe.

North Dakota.—The mean temperature was 15.7°, or 8.9° below normal; the highest was 70°, at Fort Yates on the 25th, and the lowest, 35° below zero, at Woodbridge on the 12th, and at Gallatin on the 13th. The average precipitation was 1.18, or 0.47 above normal; the greatest monthly amount was 3.27, at Ashley, and the least, "trace," at Fort Yates.

Ohio.—The mean temperature was 32.4°, or 3.6° below normal; the highest was 73°, at Cherryfork on the 30th, and the lowest, 7° below zero, at Greenhill on the 13th. The average precipitation was 3.34, or 0.61 below normal; the greatest monthly amount was 5.36, at Hanging Rock, and the least, 1.38, at Oberlin. The average depth of snowfall was 14.8.

Oregon.—The mean temperature was 43.8°, or 0.3° above normal, the highest was 80°, at Langlois on the 10th, and the lowest, 13° below zero, at Joseph on the 2d. The average precipitation was 3.89, or 0.99 below normal; the greatest monthly amount was 8.99, at Glenora, and the least, 0.32, at Umatilla.

Oklahoma.—The mean temperature was 46.8°; the highest recorded was 90°, at Beaver on the 25th, and at Purcell on the 30th; the lowest was 9°, at Beaver on the 3d. The average precipitation was 1.09; the greatest monthly amount, 2.45, occurred at Vinita, and the least, 0.10, at Mangum and Woodward.

Pennsylvania.—The mean temperature was 30.6°, or 4.5° below normal; the highest was 69°, at Carlisle and Lock Haven on the 30th, and the lowest, 18° below zero, at Dyberry on the 14th. The average precipitation was 4.51, or 1.26 above normal; the greatest monthly amount was 7.98, at Blooming Grove, and the least, 1.77, at Altoona.

South Carolina.—The mean temperature was 53.1°, or 0.9° below normal; the highest was 93°, at Gillisville on the 30th and 31st, and the lowest, 19°, at Greenville on the 21st. The average precipitation was 2.12, or 2.34 below normal; the greatest monthly amount was 4.19, at Allendale, and the least, "trace," at Shaws Forks.

South Dakota.—The mean temperature was 23.4°, or about 7.0° below normal; the highest was 86°, at Rosebud on the 24th, and the lowest, 32° below zero, at Webster on the 13th. The average precipitation was 1.83, or 0.89 above normal; the greatest monthly amount was 8.70, at Ipswich, and the least, 0.19, at Cherry Creek.

Tennessee.—The mean temperature was 45.0°, or 2.2° below normal; the highest was 84°, at Chattanooga and Newport on the 29th, and the lowest, 14°, at Bristol on the 11th and 20th. The average precipitation was 6.33, or 1.25 above normal; the greatest monthly amount was 10.48, at McMinnville, and the least, 3.21, at Chattanooga.

Texas.—The mean temperature was 1.4° below normal; the highest was 105°, at Fort Ringgold on the 30th, and the lowest, 12°, at Happy on the 12th. The average precipitation was 0.43 below normal; there was a general deficiency, except over the east coast district, where the excess ranged from 0.42 to about 5.00, with the greatest in the vicinity of Houston. The greatest monthly amount, 8.58, occurred at Houston, while there was no rain at Camp Eagle Pass, Fort Ringgold, Fort Stockton, Menardville, Midland, and Sierra Blanca.

Utah.—The mean temperature was 38.0°; the highest was 88°, at Moab on the 25th, and the lowest, 7° below zero at Heber on the 5th, and at Soldier Summit on the 31st. The average precipitation was 0.99; the greatest monthly amount was 3.46, at Millville, and the least, "trace," at Cisco and Giles.

Virginia.—The mean temperature was 41.6°, which was somewhat below normal; the highest was 77°, at Bonair on the 30th, and the low-

est, 1° below zero, at Dale Enterprise on the 13th. The average precipitation was 4.44; in the Tidewater it was 1.47 below normal; in Middle Virginia, slightly above, and in the Great Valley, 2.09 above normal. The greatest monthly amount was 12.73, at Bigstone Gap, and the least, 1.38, at Cape Henry.

Washington.—The mean temperature was 40.1°, or 0.9° below normal; the highest was 77°, at Kennewick on the 18th, and the lowest, 8° below zero, at Colfax on the 4th. The average precipitation was 2.73, or 0.78 below normal; the greatest monthly amount was 9.96, at Cascade Tunnel, and the least, 0.11, at Moxee.

West Virginia.—The mean temperature was 35.7°, or about 5.0° below normal; the highest was 76°, at Beverly on the 28th, and the lowest, 10° below zero, at Bloomery on the 13th. The average precipitation was 4.45, or about 1.25 above normal; the greatest monthly amount was 8.40, at Elkhorn, and the least, 1.76, at Rowlesburg.

Wisconsin.—The mean temperature was 23.6°, or 5.9° below normal; the highest was 66°, at Prairie du Chien on the 30th, and the lowest, 21° below zero, at Hayward on the 13th. The average precipitation was 1.33, or 1.17 below normal; the greatest monthly amount was 3.40, at Spooner, and the least, 0.30, at Stevens Point.

SPECIAL CONTRIBUTIONS.

RECENT PUBLICATIONS ON METEOROLOGY.

By Dr. J. H. McCARTY, Librarian Weather Bureau.

In response to the requests from several correspondents, the Chief of the Weather Bureau has directed that there be published regularly in this REVIEW a list of recent publications bearing on meteorology and such other subjects as come within the field of study of the officials of the Weather Bureau. In this list of authors and titles the works that have been received by the Library of the Weather Bureau will take precedence, but other works whose titles are known will also be mentioned, although they have not yet been received, in order that the correspondents of the Weather Bureau may thus receive early notice of the publication of works in which they are interested. It is to be understood, however, that those who wish to consult the works on meteorology received by the Weather Bureau must do so in its own Library, where every convenience for study is afforded, as, in fact, is also the case in all the other scientific libraries in Washington.

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London.—British Association advancement of science, 1895. *Report of the sixty-fifth meeting at Ipswich, September, 1895.* 884 pp. With list of officers, members. Pages 1-118. 8vo. London. 1895.

London.—Royal Meteorological Society. *The meteorological record.* Monthly results of observations made at the stations of the society, with remarks on the weather for the quarter ending September 30, 1895. London. 1895.

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